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826,464 COMPLETE SPECIFICATION

1 SHEET

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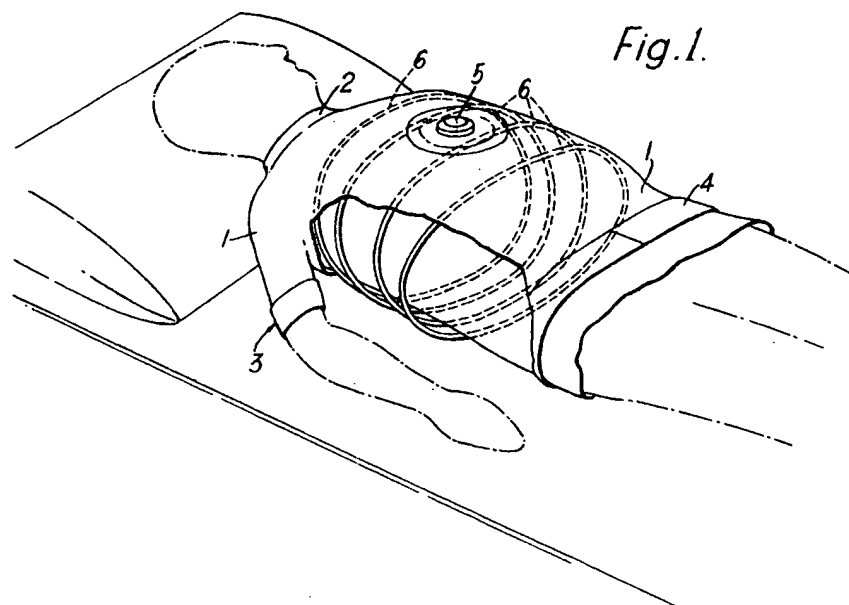


Fig. 1.

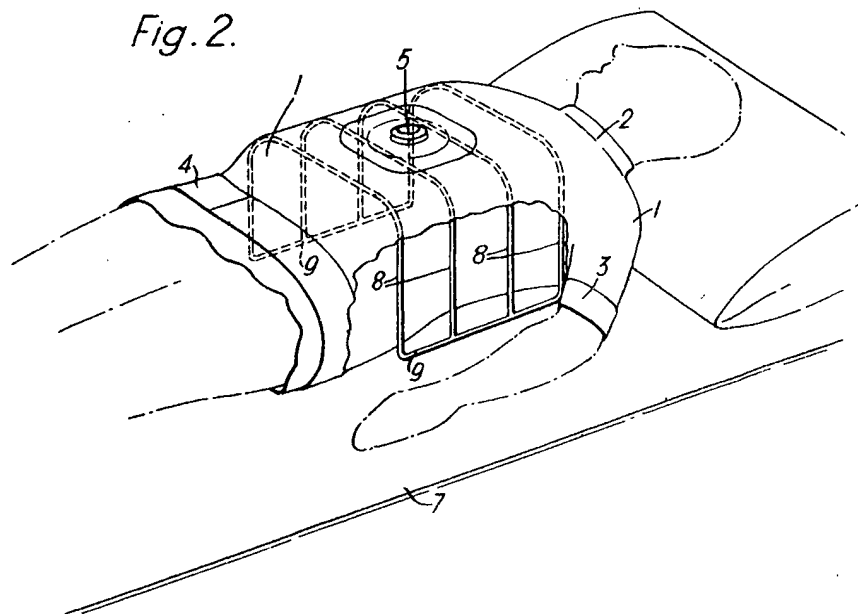


Fig. 2.

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# PATENT SPECIFICATION

826,464

DRAWINGS ATTACHED.



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## COMPLETE SPECIFICATION.

### Improvements in Mechanical Breathing Apparatus.

We, ELECTRONIC AND X-RAY APPLICATIONS LIMITED, a Company organised under the laws of Great Britain, of 17, Pennant Mews, Kensington, London, W.8, and EDWARD ALBERT JAMES TUNNICLIFFE, a British Subject, of the Company's address, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention relates to apparatus which is used for the purpose of causing the breathing action of a human being to be maintained by mechanical action : such apparatus is of course widely used for cases of nervous disorder, among which may be mentioned poliomyelitis, and also for resuscitation.

In the Specification of the Patent No. 789,593 there is described and claimed such a breathing apparatus, that apparatus comprising a garment of flexible material fashioned to fit about the upper body part or trunk of a patient and having closure parts to close against the neck, the arms and the lower part of the body, and a relatively rigid part disposed to be opposed (when the garment is fitted) to the parts of the body to be displaced to effect a breathing action, the garment having means to connect to a pulsating air supply the space between the garment and the patient and bounded by the closure parts.

The apparatus described in the Specification No. 789,593 has been found to be very satisfactory in its operation and it is the main object of this present invention to provide a modified form of apparatus which will fulfil the same function.

According to the present invention, a mechanical breathing apparatus comprises a garment of flexible sensibly inextensible and impervious material fashioned to fit

about the upper body part or trunk of a patient the garment having closure parts to be closed against the neck, the arms and the lower part of the trunk and having also means to connect it to a pulsating air supply and an openwork cage to support the garment against collapse during the negative phase of a pulsating air pressure when applied to within the garment to effect the breathing operation : the material of the garment being sensibly inextensible, the garment itself provides the reaction during the positive phases of the pulsating air supply to the chamber and so, is effective to cause the desired mechanical contraction of the whole of the body within the jacket, the garment being as stated supported by the cage against collapse during the negative phases of the pulsating air supply, during which time mechanical expansion takes place.

The cage can be formed to extend completely about the trunk of the patient or it can be arranged to extend over the trunk and to react against an external component such as a couch on which the patient would recline.

This cage can form a complete entity with the garment and it can be arranged to be inside or outside the garment or incorporated in the material of the garment.

Thus the cage could be formed of wire mesh or by a number of hoops.

The invention is illustrated in two forms of construction in the accompanying drawings, Figures 1 and 2 of which both being perspective views showing the garment and its support in position with respect to a patient.

In Figure 1, the garment is indicated at 1 and is formed to fit over the trunk of a patient and to close as indicated at 2 about the neck of the patient, at 3 about the arms of the patient and at 4 about the lower trunk or the thighs of the patient so as to form

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between itself and the trunk of the patient a chamber to which a pulsating pressure air supply is made by a connection 5 incorporated in the garment.

5 The garment is formed of a flexible material which is substantially inextensible and impervious or sensibly impervious to air; the garment is supported against collapse during the negative pulses of the air supply  
10 by a cage comprising hoops of relatively rigid material which extend completely about the trunk.

The hoops can be as shown formed as separate entities received in loops or pockets  
15 formed on the inside or the outside of the garment, the loops holding the hoops in the required space relationship to the extent of the garment. Alternatively, the hoops 6 can be tied to one another by a series of  
20 flexible cords or tapes which allow the hoops to be folded against one another when out of use and then expanded when required for use.

The hoops may be as shown undivided  
25 so as to be threaded over the trunk of a patient but it may be desirable to divide the hoops into two parts which are arranged to be separated to be passed sideways into position about the trunk and then united  
30 by a releasable clip: alternatively the two parts can be hinged together at one end and provided at their other ends with a releasable locking device.

Such a divided cage construction would  
35 be required when it is arranged to form in effect a part of the garment when the garment is constructed to be opened to be fitted about the trunk and then closed as by fasteners such as zip fasteners: in this case, the cage  
40 would be divided to coincide with the opening edge of the garment.

In the construction shown in Figure 1, the garment 1 and the cage provide a self-contained air-pressure reaction unit.

45 In the modification shown in Figure 2, the reaction for the cage is provided by a couch 7 and in this case the cage is not required to extend about the patient and can therefore be in the form of an arched cage composed of  
50 members 8 connected by ties 9 which rest on the couch, the cage holding the garment 1 against collapse.

The arrangement of this invention not only provides a portable and easily fitted apparatus but it also enables the whole of the  
55 thoracic area to be acted upon by the pulsating air pressure and so affords a maximum mechanical breathing action.

#### WHAT WE CLAIM IS:—

1. A mechanical breathing apparatus 60 comprising a garment of flexible sensibly inextensible and impervious material fashioned to fit about the upper body part or trunk of a patient the garment having closure parts to be closed against the neck, the arms and  
65 the lower part of the trunk and having means to connect it to a pulsating air supply, and an openwork cage to support the garment against collapse during the negative phase of the pulsating air pressure when applied  
70 to within the garment to effect the breathing operation.

2. A breathing apparatus as claimed in Claim 1 and wherein the cage is formed to extend about the trunk of the patient. 75

3. A breathing apparatus as claimed in Claim 1 and wherein the cage is formed to extend partly about the trunk of the patient and to react against a component such as a couch for supporting the patient. 80

4. A breathing apparatus as claimed in any of the preceding claims and wherein the cage is formed separately from and to be disposed within the garment.

5. A breathing apparatus as claimed in 85 any of the preceding claims and wherein the cage is formed on an integral or one piece structure.

6. A breathing apparatus as claimed in any of Claims 1—4 and wherein the cage is 90 formed by an assemblage of separate parts tied to one another by flexible connections or by the garment.

7. A mechanical breathing apparatus 95 substantially as described with reference to Figure 1 or Figure 2.

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#### PROVISIONAL SPECIFICATION.

#### Improvements in Mechanical Breathing Apparatus.

We, ELECTRONIC AND X-RAY APPLICATIONS LIMITED, a Company organised under the laws of Great Britain, of 17 Pennant  
100 Mews, Kensington, London, W.8, and EDWARD ALBERT JAMES TUNNICLIFFE, a British Subject, of the Company's address,

do hereby declare this invention to be described in the following statement:—

This invention relates to apparatus which 105 is used for the purpose of causing the breathing action of a human being to be maintained by mechanical action: such apparatus is of

course widely used for cases of nervous disorder, among which may be mentioned polio or as it is more commonly termed "infantile paralysis" and also for resuscitation.

In the Specification of the pending Application No. 32775/53 (Serial No. 789,593) there is described and claimed such a breathing apparatus, that apparatus comprising an encasing component which is formed to be placed about the upper part or trunk of the body and which is formed also to close about the neck, the arms and the lower part of the trunk, e.g. the hips or the upper thighs of a patient, so as to provide within the boundary of the closure a chamber between the component and the body of the patient: this encasing component is most conveniently in the form of a flexible air-tight or slightly permeable material forming a garment which incorporates a relatively rigid part which (when the garment is fitted) is opposed to the thorax, the abdomen or both of the patient to provide the desired local reaction surface against which the air pulsations applied to the chamber react to effect the desired mechanical breathing action. In one particular construction described in that Specification, the relatively rigid part is extended to react against the back of a patient.

The apparatus described in the Specification No. 32775/53 (Serial No. 789,593) has been found to be very satisfactory in its operation and it is the main object of this present invention to provide a modified form of apparatus which will fulfil the same function.

According to the present invention the garment, formed of the same flexible material as that referred to in the said Specification, is arranged to envelope the whole of the upper part or trunk of the body of a patient and to make a closure about the neck, the arms and the lower part of the trunk, the garment in itself defining the chamber between itself and the whole area of the enclosed part of the body: the material being sensibly inextensible provides the reaction during the positive phases of the pulsating air supply to the chamber and so is effective to cause the mechanical contraction of the thorax: in order to hold the garment against collapse during the negative phases of the pulsating air supply (during which time the thorax is required to be mechanically expanded) there is also provided for association with

the garment a supporting component of relatively rigid material which can be fitted about the trunk of the patient.

Such a supporting component can be of various forms to enable it to be fitted about the trunk and it can be arranged to be inside or outside the garment or incorporated in the material of the garment. The component can also be formed of various materials provided they are sufficiently rigid for the purpose.

Thus the component could be in the form of a cage of wire mesh or of a cage formed by a number of hoops having a shape approximating to the contour of the trunk. Such hoops can be separate entities to be received in loops or pockets formed on the inside or the outside of the garment, the loops holding the hoops in the required spaced relationship to the extent of the garment. Alternatively, the hoops can be tied to one another by a series of flexible cords or tapes which allow the hoops to be folded against one another when out of use and then expanded when required for use.

The cage, whether formed by the hoops or otherwise, may be undivided so as to be so to speak threaded over the trunk of a patient but it may be desirable to divide the cage into two parts which are arranged to be separated to be passed sideways into position about the trunk and are then united by a releasable clip: alternatively the two parts can be hinged together at one end and provided at their other ends with a releasable locking device.

Such a divided cage construction would be required when it is arranged to form in effect a part of the garment when the garment is constructed (as is shown in the Specification No. 32775/53) to be opened to be fitted about the trunk and then closed as by fasteners such as zip fasteners: in this case, the cage, e.g. the hoops, would be divided to coincide with the opening edge of the garment.

The arrangement of this invention not only provides a portable and easily fitted apparatus but it also enables the whole of the thoracic area to be acted upon by the pulsating air pressure and so affords a maximum mechanical breathing action.

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